NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

POND SEALING OR LINING
CATIONIC EMULSION-WATERBORNE SEALANT

(No.)
CODE 521D

DEFINITION

Installing a fixed lining of impervious material or treating the soil in a pond mechanically or chemically to impede or prevent excessive water loss.

PURPOSE

To reduce seepage losses in ponds or earthen waste impoundments to an acceptable level.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where:

1) seepage losses from a pond or waste impoundment would prevent it from fulfilling its intended purpose.

2) seepage from a waste impoundment would contaminate ground or surface water, and/or

3) soils are suitable for treatment with cationic emulsion sealant materials .

CRITERIA

Impoundment structures to be sealed shall be constructed to meet all applicable NRCS Conservation Practice Standards and may include any of the following as appropriate:

- Irrigation Storage Reservoir (Code 436)

- Ponds (Code 378)

- Waste Treatment Lagoons (Code 359)

- Waste Storage Facility (Code 425)

The treated soil liner shall be designed in accordance with National Engineering Handbook Series, Part 651, Agricultural Waste Management Field Handbook, Chapter 10, Appendix 10D.

All work shall be in compliance with federal, state, and local laws and regulations.

Soil Properties. For electrochemical sealing, soils (in the surface 2 in.) shall have proprieties approximating the USDA textural soil classification for:

1. Very fine sands, fine sands, medium sands, coarse sands, and very coarse sands.

2. Nonexpansive loamy sand and sandy loam.

If the soil is relatively uniform throughout the entire pond, the seepage rate before sealing shall exceed 1 ft/day, measured vertically. If isolated sections in an area are suspected of causing most of the seepage loss, the seepage rate in the area before sealing shall exceed 1 ft/day.

Rate of Application. The minimum rate of application shall be based on small-scale field tests with infiltration cylinders unless sufficient data are available on the field performance of previously tested soils that are similar in texture and chemical properties to the soil to be sealed.

In absence of field test results for the soils to be sealed, the minimum application shall be 1 gal/yd^2.

Thickness of Treated Liner. The finished treated liner shall be at least 6 inches thick for water depths up to 8 feet. For greater depths of water, the blanket thickness shall be 12 inches or greater as determined by procedures in Appendix 10D. The liner material shall be installed in multiple lifts of 6 inches compacted thickness. A minimum thickness of 12 inches is recommended for all areas in the vertical range of water surface fluctuation.

There shall be at least 2 feet of fine-grained soil over fractured rock outcrops or other highly permeable material in addition to the treated blanket.

A protective layer of untreated soil shall be placed over the treated liner in waste impoundments. The minimum thickness of the protective layer shall be 6 inches.

CONSIDERATIONS

Compaction of thin layers on steep slopes is difficult to accomplish without leaving discontinuities in the liner. To preserve the integrity of the liner, consideration should be given to flattening the slopes of waste holding ponds or dug ponds. As an alternative, liners on steep slopes may be constructed using the stair step method as described in Appendix 10D. Consideration should be given to providing a protective layer of soil over the treated liner in ponds where fluctuating water levels may contribute to erosion of slopes. The untreated soil cover will provide a sacrificial zone that can withstand some erosion while protecting the underlying treated liner.

Consideration should be given to fencing the impoundment structure for the safety of humans, livestock, wildlife, and pets and to protect the liner from damage.

PLANS AND SPECIFICATIONS

Plans and specifications are to be prepared for each specific site based on this standard. They shall include such drawings, specifications, material requirements, quantities, construction requirements, equipment requirements, and other documents as are necessary to describe the work to be done.

OPERATION AND MAINTENANCE

Maintenance activities required for this practice consist of those operations necessary to prevent breaching of the treated soil layer. This includes excluding cattle and equipment from the treated area, protection of the layer during initial filling, agitation, or pumping operations, and repair of disturbed or eroded areas.

REFERENCES

National Engineering Handbook Series, Agricultural Waste Management Field Handbook, Chapter 10, Part 651, Appendix D

Kentucky NRCS Conservation Practice Standards:

Code 436 - Irrigation Storage Reservoir
Code 378 - Pond
Code 359 - Waste Treatment Lagoon
Code 313 - Waste Storage Facility

CONSTRUCTION SPECIFICATION

POND SEALING OR LINING (Cationic Emulsion-Waterborne Sealant)
521D

Scope

This specification consists of the material requirements and construction procedures necessary for construction of a cationic emulsion-waterborne sealant treated soil liner for sealing of ponds, including waste impoundments.

Construction operations shall be carried out in such a manner that erosion, water, air, and noise pollution will be minimized and held within legal limits as established by state regulations.

Materials

The sealant should be a stable o/w emulsion of suitable bituminous, resinous, or polymeric bases having infinite dilutability and good stability after dilution in all fresh waters of any native hardness. (The emulsion must be infinitely dilutable in the water to be treated without causing the asphalt to break). Discrete sealant droplets shall be able to coalesce at 40 degrees F or above as they deposit on underlying soil.

The sealant must conform to the following specifications and testing procedures (ASTM-D-2397) applicable to the soil sealant):

Installation

The area to be treated shall be cleared of vegetation and trash. If practical, a soil sterilant shall be applied to the soil before applying the sealant. Water to be treated must not contain suspended sediment in amounts sufficient to coagulate the waterborne sealant. Dry or newly constructed ponds shall be mechanically compacted.

The sealant material shall be inspected before use. Containers shall be checked to see if any asphalt has settled; settled asphalt cannot be easily remixed. If the emulsion contains lumps of asphalt, it shall not be used.

In dry structures, the sealant shall be added at a uniform rate to the incoming water during filling operations so that all sealant is added and mixed when the pond is filled. During treatment, the pond shall be filled from 6 to 12 in. above the normal operating level. The air and water temperature shall be above 40 degrees F.

If the pond is full, the sealant may be pumped or poured around periphery of the pond at intervals. Immediately after the sealant is added, however, it must be thoroughly mixed and dispersed in the water by a suitable means, such as circulating the water with a large-volume pump. A 72-hour residence time shall be allowed for the sealant to deposit on the underlying soil. A water level of 6 to 12 in. above the operating level shall be maintained during the residence.

Treated areas must be protected from mechanical damage, such as puncture by livestock trampling, and from plant growth through the treated surface. Areas near the waterline and at points of concentrated surface flow shall be protected against erosion.

Sediment coagulating chemicals, such as gypsum or iron sulfate, shall not be used to clear pond water after treatment.

Specifications	Cationic soil sealant Minimum	Maximum
Viscosity (Saybolt Furol), 122o F (50o C)……..... s……...	20	100
Settlement, 5 days…… pct….....	-	5
Particle charge test……....	Positive	-
Sieve test…….....pct..……	-	-0.10
Distillation[1]		
Oil distillate, by volume of emulsion ……..... pct..……	-	3
Residue……....pct……	60	-
Test on distillation residue		
Penetration, 77o F (25o C)……100 g (5 s)	100	200
Ductility, 77o F (25o C)…….. cm..……	40	-
Solubility in carbon disulfide……..... pct…….	98	-

[1] Evaporation test may be used instead of distillation for percentage of residue and penetration.

Testing procedures	Test Method
Viscosity ……..	ASTM-D-244
Settlement ……..	ASTM-D-244
Particle charge ……..	ASTM-D-244
Sieve ……..	ASTM-D-244
Distillation ……..	ASTM-D-244
Evaporation ……..	ASTM-D-244
Penetration ……..	ASTM-D-5
Ductility……	ASTM-D-113
Solubility ……..	ASTM-D-4